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Health care in and outside a DMP for type 2 diabetes mellitus in Germany-results of an insurance customer survey focussing on differences in general education status

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Abstract

Aim The Disease Management Programmes (DMPs) introduced in Germany since 2003 are intended to improve health care for the chronically ill. Whether they do this is currently being investigated in various evaluation settings. In order to assess possible changes in the process quality from the point of view of patients, the BARMER health insurance company conducted a national postal survey in Germany in 2007 of its customers with diabetes mellitus type 2 in order to compare programme participants and non-participants. This evaluation is a sub-analysis intended to clarify whether the utilisation, acceptability and perceived benefits of the programme differ as a result of educational status.

Subjects and Methods A nationally representative random sample was drawn from BARMER insurance customers with type 2 diabetes, aged 45–79 years. Questionnaires were evaluated from 38.5% of the sample (DMP-participant respondents: $n=2,158$; non-participant respondents: $n=2,182$).

Results A lower educational status was related among other things with increased morbidity, a poorer level of informa-

tion and also a less well-developed “preventive attitude” to the disease. The finding that 49% of participants had a higher school qualification compared with 45% of non-participants, although significant, is less pronounced than the differences found between DMP participants and non-participants for other values analysed. A social influence could be found concerning the differences in treatment provided within the programme. A multivariate analysis shows that both the participation in the programme and higher levels of education have independent positive effects on the satisfaction with health status, with the effect of programme participation being stronger.

Conclusions It can be assumed that the clear differences established between the groups of DMP participants and non-participants can in no way be explained solely by the comparatively small difference related to school education. Patients obviously appreciate the fact that the health personnel and the insurance company are paying increased interest to their disease, and this is true to an increased degree for participants with only basic schooling. Although overall this group is significantly under-represented among the participants, they reported to an increased degree that they were profiting from the programme.

Keywords Disease management programme · Diabetes mellitus · Evaluation · Demands on doctors · Doctor-patient relationship · Coping · Social status · Educational level

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Introduction

Disease Management Programmes (DMPs) were introduced as one of the new instruments for the integration of health care structures (Saltman and Otter 1995; Todd and Nash 1997; Veeder and Peebles-Wilkins 2001). The statutory

health insurance funds (SHIs) receive additional compensation if their chronically ill customers enrol in structured care programmes, as an economic incentive to encourage both doctors and the statutory health insurance funds to improve the quality of care. The programmes are inter-sectoral, with evidence-based guidelines (Busse 2004; Graft 2006).

Currently, some 4 million customers of insurance companies in Germany are participating in a DMP for diabetes mellitus type 1 and type 2, coronary heart disease, breast cancer, asthma or COPD. Of these participants, more than 2.5 million are enrolled in the DMP for diabetes mellitus type 2.

In Germany there were reservations from the start about whether the experience in other countries with DMPs (cf. e.g. Robinson and Steiner 1998; Weingarten et al. 2002; Selby et al. 2003; Knight et al. 2005) would be transferable to the German health care system. Other concerns were directed less towards the programme itself and more against its integration in the system of risk structure compensation, and the incentives associated with this (cf. e.g. SVR 2007). Doubts were raised that the programme would be able to reach the right patient target groups (cf. Lippmann-Grob et al. 2003; Häussler et al. 2005; Dunkelberg et al. 2006).

There are also reasons to be sceptical about whether structural problems concerning the care of the chronically ill can be resolved for individual disease groups in isolation. In the positive case, that would at least mean that over a realistic period it was possible to modify in the intended way patterns of behaviour that have grown over many years both on the part of the health care providers and on the part of patients. We also include here the alteration of doctor-patient relationship and an activation of the patient role in the sense of ‘shared decision making’ (cf. Scheibler and Pfaff 2004; Faller 2006).

Previously published results from the so-called quality reports of the contractual partners in Germany at the federal state level for the DMP for diabetes mellitus type 2 (e.g. Altenhofen et al. 2006) do not provide a conclusive picture. Within the framework of the legally required evaluation, it is obligatory to conduct additional surveys of insurance customers, but these are restricted to studying the progress of the health-related quality of life without including a control group, as would be necessary for methodological reasons (cf. Gerlach et al. 2003; Morfeld and Koch 2005; Wegscheider et al. 2006).

In order to be able to investigate a possible change in the process quality from the point of view of the patients, the BARMER health insurance company commissioned a comparative national survey of its customers with diabetes mellitus type 2 in 2007 (programme participants and non-participants). The evaluation—commissioned by BARMER—was carried out by the Neubrandenburg University of Applied Sciences in cooperation with FB+E Institute.

Before the national survey, a regional survey was carried out of BARMER customers to determine preferences, motives and evaluations of participants in the DMP for diabetes mellitus type 2 (Elkeles et al. 2007). Among other things, this gave indications of:

- Participant interest in improved quality of care and a more active patient role,
- A doubling of the proportion of those visiting a specialist in diabetology compared with the period before enrolling in the DMP,
- Improvements in the evaluation of the quality of care and the state of health and
- Slight social selection processes.

Since the group reporting the most benefits was already relatively well informed about their own disease, it was not completely possible to discount critical comments such as those advanced by Eller et al. (2005) that these health programmes may involve social selection processes similar to those encountered in many other health programmes. Against the background of the general results of the BARMER insurance survey in 2007 (Elkeles et al. 2008), this contribution therefore concentrates on the social influence, measured by the level of school education as indicator, on the care received for diabetes mellitus and on the care in the DMP itself.

The main findings, comparing participants and non-participants in the BARMER diabetics survey of 2007 are (Elkeles et al. 2008):

- Some 57% of respondents were totally or very satisfied with the care their doctor provided for diabetes, the participants significantly more so with 61.1% compared to 52.6% for non-participants. Only about 6% of respondents were less satisfied or dissatisfied—with no significant difference between the groups.
- More DMP participants (80.6%) assess their level of information about the causes and consequences of diabetes as good to very good, compared with 69.6% of non-participants.
- The doctor-patient relationship was mostly viewed positively. In all items, DMP participants were significantly more often positive than non-participants, so significantly more DMP participants (88.2%) agreed with the statement “My doctor involves me in the decisions” than non-participants (80.6%). Also the statements about the behaviour of practice nurses showed a significantly better evaluation by DMP participants.
- More DMP participants than non-participants were receiving treatment mainly from a diabetology practice (29.2% vs. 15.2%, highly significant). Doctors arranged therapy targets more frequently with DMP participants

(84.9% vs. 70.8%, highly significant). In the case of HbA_{1c} values, 72.6% of DMP participants were set a target, significantly more than non-participants (57.2%).

- Non-DMP participants had on average 1.95 contacts with doctors each quarter compared to DMP participants who had 1.78 contacts. Of the participants, some 65% went only once per quarter for the check-up investigation (non-participants: 58%). But 21% of the non-participants reported contacting the doctor's office three times or more per quarter (participants: 17%). The overall contact frequency of DMP participants was lower, even though these patients were more severely ill and had higher co-morbidity.
- For DMP participants, 83.8% had their feet inspected, a highly significantly larger proportion than for non-participants (63.6%); also a higher proportion had had an inspection in the year of the survey (61.7% and 44.1%, respectively).
- Regular eye inspections were carried out on 91% of all respondents, which is a higher percentage than for foot inspections. Eye inspections were also more frequent among DMP participants (96.2%) than among non-participants (85.3%).
- Asked about HbA_{1c} values, some 68% of all respondents said they knew about this, with a highly significant difference between DMP participants (80.3%) and non-participants (55.8%). DMP participants had significantly better mean values (6.92%) than non-participants (7.02%). Among non-DMP participants, there was a sub-group with very poorly controlled diabetes, as indicated by the very similar median (6.8%) and the high standard deviation among the non-participants.
- There was a recognisable tendency for non-DMP participants to have a less active approach to coping with diabetes due to knowledge deficits and a generally 'less-preventive' attitude.
- Significantly more non-DMP participants (26.2%) were dissatisfied with their state of health than participants (22.7%). In both groups, one third were satisfied with their condition. Non-DMP participants were significantly more frequently dissatisfied with their life in general than participants (17.8% vs. 14.2%). And participants were more frequently satisfied with their life.
- Some two thirds (63.4%) of the participants described their state of health as excellent to good (non-participants: 60.7%), 35.5% as not so good to poor

(non-participants with 38.5% significantly more frequently). Of DMP participants, 83.8% had already had diabetes for more than 5 years compared to 84.1% of non-participants.

- More participants (12.4%) assessed the state of their disease as severe (not significant). Significantly more non-participants assessed their disease as less severe to not severe (34.0% vs. 28.4%). The majority of both groups responded with "Not so bad" (Es geht).
- DMP participants had a much more pronounced multi-morbidity profile than non-participants. In accordance with their higher morbidity, DMP participants suffered more frequently from painful feet and were more frequently worried about being helpless later and in need of nursing. Nevertheless, more of the DMP participants said that their quality of life had not suffered from diabetes.

Data and methods

A standardised questionnaire was developed with 51 questions for both DMP participants and non-participants addressing the following topics: health status; life quality¹; duration of disease; type/place of treatment; comorbidity, disease coping; frequency of visits to doctor, care and therapy objectives; satisfaction with the treatment for diabetes, and the relationship with the doctor and medical personnel; information and participation in training courses; diabetes check-ups, customer satisfaction and knowledge about the DMP. In the second part of the questionnaire, the DMP participants were asked in 13 further questions about their motives for taking part in the programme, changes since they started participating, and their satisfaction with the programme.

Sampling strategy of the insurance customer survey

In contrast, for example, to another on-going study in which patient samples were drawn from two German federal states on the basis of their visits to general practitioners (Joos et al. 2005, Miksch et al. 2008; Szecsenyi et al. 2008), in our study the basic data of programme participants and non-participants with diabetes

¹ Standard instruments for evaluating health-related quality of life, such as SF 12 or SF 36 (Bullinger and Morfeld 2004), are not specifically designed with diabetes in mind. With no validated standards for diabetes-specific instruments (cf. Hirsch 1996, Altenhofen et al. 2005), items were included that were tailored to diabetes type 2.

were drawn directly and nation-wide from BARMER Health Insurance.

From the total customer register of the health insurance company, the population “all type 2 diabetics” was selected as follows:

BARMER insurance customers aged 45 to 79 years who had been prescribed anti-diabetic drugs both in February 2005 and also in January 2007. A clear allocation to a type of diabetes is often not possible using the data available. However, if there was an indication of diabetes mellitus type 1, then the individual was not included in the initial population.

We also excluded type 2 diabetics employed by BARMER health insurance company.

The population was determined on 22 February 2007.

Two sub-groups were then formed: DMP participants and non-DMP participants:

Participants were all those who had taken part in the DMP for at least 1 day.

Non-participants had never taken part in the DMP.

From the groups of participants and non-participants, 5,000 diabetics from each were included in a randomised fashion in the sample.

An initial random sample of 1,500 insurance customers was taken from the population of insurance customers who had been DMP participants for less than 1 year (as of 1 May 2007). Since they formed a comparatively small proportion of the overall population, it was expected that the numbers responding would otherwise be too low, and this could possibly have consequences for the measurement of effects thought to be related to the length of participation.

By mid-May, questionnaires had been sent out to 11,500 insurance customers. Responses had to be received by 30 June 2007 to be included in the evaluation.

Responses were received from 38.5% of the random sample. This is very respectable for a survey that went without follow-up reminders due to time constraints and that was aimed at a group of elderly recipients. After eliminating 80 responses that were incomplete or implausible, we were left with $N=4,340$ responses for evaluation (DMP participants: 2,158, and Non-participants: 2,182). Because 97 DMP participants did not say how long they had been taking part, only 2,061 participants were considered when analysing the factor programme participation “since about 1 year” or since at least “about 2 years”.

It was now important to test how representative the respondents were, and in particular in this case whether respondents with an active attitude to health were overrepresented or not. We found no significant differences for the variables “health status” and “managing with diabetes” between the group of early respondents and those who only returned the questionnaire shortly before the deadline (late respondents). The fact that we found no difference here

between early and late respondents argues against the hypothesis that the random sample was specifically selective concerning this factor.

The structural differences in age groups and in average age were small overall—with the exception of the group of non-DMP participants. Due to the given structural differences, the data were weighted for the expected distributions in the population. In other words the net random sample was “standardised” according to age and gender for the relevant distribution relationships in the population. Overall the random sample deviated very little from the structure of the population, and so the weighting factors were very low, apart from for the non-DMP participants. This also applies for the generally small differences between the expected values and the range of the upper and lower confidence intervals.²

Since the study was concerned with the investigation of process quality, a range of variables had to be investigated, and there were no specific target variables or even “endpoints”. However, it seemed appropriate, in particular with multivariate analyses, to define the measurements of satisfaction (cf. Hall and Dornan 1988; Grogan et al. 2000) as a target variables.

In some items multiple responses were possible, i.e. answers were not mutually exclusive.

In order to examine the statistical importance of bivariate differences between participants and non-participants, the t-test and z-test were used, taking a confidence interval of 95%, i.e. a probability of error of 5% ($\alpha=0.05$).

For multivariate analyses, log regressions were carried out. The health satisfaction was chosen as the target variable, expressed as a binary code and examined for the effect with other variables.

Results

Basic and middle or higher school education in comparison

Social demographic and satisfaction target variables

As shown in Table 1, significantly more participants had a middle or higher school qualification (48.8%) than non-participants (44.6%). Due to the significant differences in the age structures, for the following bivariate analyses

² In addition, another type of standardisation was tested according to age and gender. Assuming that non-participants and participants would be similar in terms of both age and gender structure (which is not in fact the real situation, but which leads to full control of these factors), the non-participants were standardised separately to the participants for gender according to age. This led to slightly different values for proportions behind the decimal point without influencing the significance values determined.

Table 1 School education (in %)

	DMP participant n=2,061	Non-DMP participant n=2,182	p
Basic school qualification	46.4	49.7	0.0293
Middle or higher school qualifications	48.8	44.6	0.0058
No/other school qualification	4.3	4.5	0.7490

p: p-value

weighting factors were used to “standardise” data, so that the distribution according to age categories of respondents with middle or higher school education was completely matched to that for respondents with basic schooling.

There were no differences in responses, either with regard to school education or to participating or not participating in the programme, to the question: “How well in general do you cope with your diabetes?” In each case 69% said that they coped well or very well.

There were clear differences, however, for the target variable of satisfaction (Table 2).

Whereas a higher level of school education was not associated with a difference between participants and non-participants for satisfaction with state health or with life in general, in the group with basic schooling the proportion who were dissatisfied was higher than in the group with more school education, and was also higher in comparison with the programme participants.

The situation is different regarding the satisfaction with the diabetes care provided by the doctor: in this case, both educational groups of non-participants were less frequently very satisfied or completely satisfied than the DMP participants. A larger proportion of DMP participants with basic schooling show a higher level of satisfaction than those with higher levels of education (Table 2).

Information and attitudes to the disease

Unsurprisingly, the self-assessment of the state of knowledge about diabetes was better for higher levels of school education than for basic schooling. The proportion who said they were well informed or very well informed in each case is higher for the programme participants than non-participants (basic schooling: 79.1% vs. 66.0%, $p<0.001$; higher school education: 81.7% vs. 75.0%, $p<0.001$). The same applies for the knowledge about HbA_{1c} values (basic schooling: 79.1% vs. 54.0%, $p<0.001$; higher level of school education: 81.6 vs. 59.2, $p<0.001$).

About 48% of the respondents with basic schooling agreed that “You have little or no influence on whether you get diabetes or not” and 44% of those with higher levels of school education, in each case without a statistically significant difference related to programme participation. A strict diet was experienced as a sacrifice (“I have to go without tasty food”)—without significant influence according to programme participation—by fewer respondents with a higher level of schooling and more respondents with only basic schooling, and of these fewer programme participants (47.3%) than non-participants (53.2; $p<0.01$). There is a similar trend for disease prevention-orientation or non-prevention orientation. The statement “It is soon enough to

Table 2 Satisfaction according to school education and DMP participation (in %)

	Basic schooling			Higher level of schooling		
	P n=986	NP n=1,104	p	P n=1,068	NP n=952	p
Satisfaction with health						
Dissatisfied (value 1–3)	22.1	26.9	0.0107	22.9	23.3	0.8337
Satisfied (value 5–7)	32.4	32.0	0.8451	37.5	37.4	0.9601
Satisfaction with life						
Dissatisfied (value 1–3)	12.4	17.6	0.0008	15.3	15.5	0.9045
Satisfied (value 5–7)	30.4	28.7	0.3954	23.6	23.1	0.7872
Satisfaction with diabetes care						
Very to completely	63.2	52.0	0.0000	60.7	53.4	0.0009
Satisfied	30.1	39.7	0.0000	33.0	38.6	0.0089
Less to not at all	4.8	5.3	0.6019	5.2	6.0	0.4355

P : Participant

NP: Non-participant

p: p-value

change your behaviour when the diabetes causes you real problems” was confirmed by significantly more respondents with basic schooling. In both educational groups, however, fewer DMP participants agreed with the statement (basic schooling: 29.4% vs. 35.7%, $p<0.005$; higher level of schooling: 21.5% vs. 26.5%, $p<0.01$).

Treatment, check-ups, therapy goals, training programmes, doctor-patient relationship

More than half of all the respondent diabetics were mainly treated by a general practitioner, and as a trend more of those with only basic schooling. There was a particularly marked difference between the proportions of programme participants and non-participants being treated in a medical office focussing on diabetology. The higher proportion of programme participants in this case only differs slightly with level of schooling (Table 3).

The results are very similar concerning the regular checks of feet, eyes and blood pressure. There is a significant difference with respect to programme participation and hardly any difference relating to level of schooling (feet: basic schooling: 84.9% vs. 36.1%, $p<0.001$, higher level of school education: 82.1% vs. 63.0%, $p<0.001$; eyes: basic schooling: 96.1% vs. 87.6%, $p<0.001$, higher level of schooling: 95.7% vs. 83.6%, $p<0.001$; blood pressure: basic schooling: 97.0% vs. 93.9%, $p<0.001$, higher level of schooling: 95.8% vs. 93.8%, $p<0.005$).

This is continued for the proportion of those who had agreed on therapy goals with their doctor (basic schooling: 84.8% vs. 57.3%, $p<0.001$, higher level of schooling: 85.5% vs. 74.1%, $p<0.001$), who had been informed by their doctor about the possibility of taking part in diabetes training programmes (basic schooling: 88.1% vs. 73.0%, $p<0.001$, higher level of schooling: 88.8% vs. 72.6%, $p<0.001$), and at a clearly lower level about participation in blood-pressure training (basic schooling: 27.7% vs. 17.7%, $p<0.001$, higher level of schooling: 26.6% vs. 21.2%, $p<0.001$) as well as for the actual

participation in a diabetes training course (basic schooling: 82.2% vs. 57.3%, $p<0.001$, higher level of schooling: 81.4% vs. 54.9%, $p<0.001$), and a blood pressure course.

The differences in the relationship with the doctor were on the whole stronger with relationship to DMP participation/non-participation than schooling. The statements “My doctor has informed me in detail about my diabetes”, “I have full confidence in my doctor” and “My doctor always takes me seriously” were confirmed with only slight differences according to level of school education by over 90% of the programme participants and thus more than the non-participants (with the exception that for higher school education it is only significant for “My doctor has informed me in detail about my diabetes”). The responses to “My doctor listens carefully to what I say” differ significantly for basic schooling (participants: 54.6% vs. 47.6%, $p<0.005$), although at a lower level than for the higher level of school education (participants: 60.6% vs. 56.5%, n.s.).

Concerning doctor’s nurses (“Whenever I have questions about diabetes, the doctor’s nurse gives me understandable answers”, “The nurse has encouraged me to find out more about diabetes”), there are no differences with respect to DMP participation at higher levels of education, but there is a significant difference for basic schooling, and at a higher level of agreement than for the higher level of education, where the nurse obviously plays a less important role in providing information.

“My doctor always involves me in the decisions” (shared decision-making) was confirmed by more participants both among those with basic schooling and (at a slightly higher level) those with higher level school education (basic schooling: 87.8% vs. 77.5%, $p<0.001$, higher level of schooling: 88.8% vs. 84.5%, $p<0.01$).

This pattern of a lower influence of education compared with participation in the DMP programme is also repeated for the proportion of smokers (higher for non-participants) and the responses about sporting activity (higher for participants, although with an overall higher level for those with a higher level of education).

Table 3 Main treatment of diabetes in the past 3 months according to level of education and DMP participation (in %)

	Basic schooling			Higher level of schooling		
	P n=986	NP n=1,104	p	P n=1,068	NP n=952	p
General practitioner	53.0	63.6	0.0000	50.7	57.8	0.0013
Internist, not diabetologist	15.4	20.4	0.0028	29.9	17.4	0.0000
GP focussing on diabetology	27.1	13.6	0.0000	29.9	17.4	0.0000
Others	0.2	0.7	0.0838	0.4	1.0	0.1098

P : Participant

NP: Non-participant

p: p-value

Table 4 State of health according to educational level and DMP participation (in %)

	Basic schooling			Higher level of schooling		
	P n=986	NP n=1,104	p	P n=1,068	NP n=952	p
Subjective estimate of health status						
Excellent to good	61.0	57.9	0.1500	65.5	66.1	0.7795
Less good to bad	37.6	41.2	0.0931	33.1	32.9	0.9204
Duration of diabetes						
Up to 4 years	15.2	21.9	0.0000	15.8	22.5	0.0001
5 to 10 years	34.6	40.2	0.0081	37.5	39.5	0.3577
More than 10 years	49.1	36.8	0.0000	46.0	36.9	0.0000
Severity of the disease						
Less severe to not severe	27.2	33.4	0.0020	30.0	36.1	0.0037
Not so bad	57.6	53.8	0.0081	56.0	50.8	0.0194
Severe to very severe	12.9	10.8	0.1390	12.5	11.5	0.4903
Impediments in every day situations						
Severe	6.4	7.3	0.4180	7.4	5.4	0.0169
Somewhat	49.6	45.8	0.0820	47.2	43.8	0.0017
Not at all	42.2	44.9	0.2151	44.1	49.4	0.0169
Most frequent accompanying diseases						
Increased blood pressure	69.8	63.5	0.0022	65.8	59.6	0.0169
Joints, back, spinal discs	61.2	54.2	0.0012	54.1	47.2	0.0019
Elevated blood lipid values	37.9	34.5	0.1075	36.7	34.1	0.2226
Circulation problem affecting the nerves	20.8	16.1	0.0058	19.8	20.4	0.7339
Retinopathy	15.3	17.8	0.1237	15.1	12.9	0.1529
Allergies/skin diseases	16.6	13.6	0.0529	20.1	13.2	0.0000
Cardiovascular system	12.8	9.7	0.0529	12.9	8.4	0.0009
Angina pectoris	12.0	10.6	0.3126	12.0	9.6	0.0820
Sum of choices	322.2	299.9		314.3	277.7	

P : Participant

NP: Non-participant

p: p-value

State of health, morbidity and mental well-being

Finally, a comparison is made both in terms of schooling and programme participation of states of health, morbidity and mental well-being, where the influences of social status or of education in general are well known.

There is indeed a markedly higher proportion with only basic schooling who say that their state of health is less good or bad, also with a higher proportion for non-DMP participants than participants, although this is not statistically significant (Table 4).

This corresponds to the fact that a duration of diabetes above 10 years is more frequent among those with basic schooling, although the difference among both educational groups is greater for those who participate in the programme. There is no statistically significant difference for the severity of the disease, although “less severe to not bad” is less frequent for those with only basic education and in each group less frequent for the DMP participants. This higher morbidity on the one hand related to a lower level of education and on the other hand programme participation is also shown overall for the “Extent to which

diabetes hinders carrying out daily tasks, e.g. at home or at work”. The same applies for the frequency of accompanying diseases or multi-morbidity (Table 4), and for mental well-being, which is not shown here.

*Analyses of the DMP participants**Reasons for signing on to the DMP programme*

The main reasons given for signing on to the DMP programme were the expectation of closer cooperation with the doctor and more intensive treatment. Three-quarters of the DMP participants believe that they will avoid repeat investigations, or they hope to be handled better by BARMER. About two-thirds of the DMP participants who replied hoped for more concessions; the same number expected more information. Free advice on diet and the possibility to take part in courses were given with about equal frequencies as reasons for signing on to the programme. The main reasons for deciding to participate were the quality of care and the doctor-patient relationship. And, again, few respondents had a monetary motivation to

take part, although this is frequently mooted as a control instrument in health policy discussions. The offer of a bonus of 40 euros only ranks fifth among the reasons to participate in the DMP programme.

In Table 5, the reasons are ranked and differentiated according to level of school education, showing very few differences in the actual rankings. However, with the exception of better care by the doctor and the avoidance of repeat investigations, there was a tendency for a higher proportion of participants with basic schooling to choose a given reason. This applies in particular for the reasons outside the top five, which all relate to the services expected from the health insurer. Here it seemed that participants with higher levels of schooling felt less need for improvements.

Changes since participating in the DMP

Almost half the DMP participants said that their state of health had improved since they started participating. Some 45% saw no improvements in their state of health, and only 4% said things had gotten worse (Elkeles et al. 2008). There was no difference in the changes in state of health between participants with basic or higher levels of school education.

Of 20 questions about changes or improvements due to the participation in the DMP, 13 were answered positively by a majority of participants (responses “correct” or “completely correct”). Overall, the top place was paying more attention to check-ups and to values and doctor’s appointments. Almost three-quarters agreed that their diabetes was controlled better. Almost half said that their blood pressure and blood lipid levels had fallen.

Differentiated in terms of schooling, once again for similar rankings a majority of statements from the participants with basic schooling were agreed with significantly more frequently (Table 6). Of these, only one is a negative

evaluation (“Don’t see any benefits”; 28.2% vs. 23.9%); all other significant differences relate to positive statements. According to their own statements, the participants with only basic schooling benefited more from the DMP than participants with a higher level of schooling (Table 7).

For more than 59% of the participants, the medication was not changed. More than a quarter of the participants said that the doctor advised them above all to start a diet. This was stated by significantly more participants with basic schooling (30.1%) than participants with higher levels of schooling (23.0%).

For 54.8% of the participants, the number of visits to the doctor was unchanged, 36.7% paid more visits and only 5.6% saw their doctor less frequently. There was no difference here according to level of school education.

Nearly two thirds (61.3%) of participants thought that their doctor took more time for them. Significantly more of the participants with basic schooling (63.0%) than of participants with a higher level of schooling (57.6%) said that the doctor had had more time for them since they began participating in the programme.

Comments about the programme, satisfaction, willingness to participate again and recommendations to others

Of the DMP participants, some 51% said they had heard about the programme from BARMER, and 76% said their doctor had told them about it. Significantly more participants with only basic schooling (45.8%) were told about the programme by their general practitioner than participants with higher levels of schooling (41.0%).

Nearly half (44.5%) of the participants were completely or very satisfied, 46.5% said they were satisfied and only 6.2% were less satisfied or unsatisfied. A fifth (20.4%) of those with basic schooling were completely satisfied compared with 14.3% of those with higher levels of schooling (significant).

Table 5 Reasons for signing up to the DMP according to level of schooling (in %)

	Basic schooling n=986	Higher level of schooling n=1,068	p
More intensive treatment/checks	90.7	89.4	0.3422
Closer cooperation doctor/patient	91.5	88.8	0.0386
Better care by doctor	86.0	86.7	0.3473
Avoiding repeat investigations	77.8	79.5	0.3473
Bonus	73.8	69.6	0.0317
Better service by BARMER	74.3	66.6	0.0001
More concessions from BARMER	72.0	67.4	0.0057
Possibility to take courses	70.1	68.4	0.3954
Diet advice	60.0	56.0	0.0630
More information from BARMER	63.3	57.8	0.0105
BARMER health telephone	29.1	20.4	0.0000

p: p-value

Table 6 Changes since participation in the DMP according to schooling (in %)

	Basic schooling n=986	Higher level of schooling n=1,068	p
My diabetes is controlled better	74.7	71.5	0.1012
Treatment is more intensive	75.4	74.4	0.6313
Better guidance for self-control	75.4	69.2	0.0018
My doctor takes more time	72.5	66.9	0.0052
Doctor pays more attention to appointments	81.5	76.0	0.0022
I pay more attention to values and appointments	82.9	77.3	0.0017
Pay more attention to the illness	72.6	65.5	0.0005
Had hoped for more	32.2	34.0	0.3736
Don't let things drag so easily	64.9	58.4	0.0025
Less afraid of later consequences	58.7	49.1	0.0000
Know that check-ups are important	88.8	83.3	0.0003
Check values myself	75.7	66.2	0.0000
Pay attention to more movement	71.8	67.2	0.0239
Have changed my diet	65.1	61.5	0.0918
Don't smoke any more	28.8	27.4	0.8415
Everything is a lot of trouble	17.8	14.8	0.0616
Living with diabetes not really better	41.2	39.9	0.4903
My blood pressure has fallen markedly	49.5	40.7	0.0000
My blood lipid levels have sunk markedly	48.4	44.5	0.0768
Don't see any benefits	28.2	23.9	0.0259

p: p-value

Table 7 Multivariate model: Health satisfaction

	n 2,321	Odds ratio ¹	95% lower confidence interval	95% upper confidence interval	p
DMP					
Non-participant in DMP	1,191	0.76	0.63	0.91	0.0027
Participant in DMP	1,130	1			
Sex					
Male	1,314	1			
Female	1,007	0.64	0.54	0.77	0.0000
School education					
Basic schooling	1,147	0.83	0.69	0.99	0.0368
Higher schooling	1,881	1			
Duration of diabetes disease					
Up to 10 years	1,383	1.08	0.89	1.30	0.4453
More than 10 years	938	1			
Age					
45–59 years	410	0.72	0.56	0.93	0.0118
60–69 years	923	1.15	0.94	1.40	0.1673
70–79 years	510	1			
Type of care					
Diabetology centre	510	0.81	0.65	1.01	0.0649
Internist	431	0.91	0.72	1.16	0.4618
General practitioner	1,380	1			
Severity of diabetes					
Less/not severe	855	7.59	5.57	10.33	0.0000
Not so bad	1,157	2.78	2.10	3.68	0.0000
Severe to very severe	460	1			

¹ Results for health satisfaction, value 5–7 on a 7-point scale (1=very unsatisfied, 7= very satisfied)

Reference: satisfied, less satisfied and not satisfied, value 1–3, with the health

p: p-value

Given this high level of satisfaction with the programme, it is not surprising that 94.0% of participants said that they would choose to take part in the programme again, and a similar proportion would recommend it to others. The willingness to recommend it to friends and relations with diabetes was once again (significantly) more prevalent among participants with basic schooling (92.6%) than among participants with higher levels of schooling (89.8%).

Multivariate analyses

For all the respondents with diabetes mellitus type 2, *health satisfaction* is a key indicator for health and for successful care (“How satisfied are you with your health?”, Table 2).

For multivariate analysis, the three highest categories of health *satisfaction* (value 5–7 of a 7-point scale) formed one group, and the lowest three categories (values 1–3) were also combined in a reference group. The influence on these binary satisfaction values for health satisfaction was measured simultaneously with logistic regression with the factors *DMP participation*, *age* (classified), *school education* (basic or higher), *duration of the diabetes disease* (classified), *type of doctor* and the perceived *severity of the disease*. The group of those less or not satisfied with their health was chosen as a reference in the model.

Overall there were 1,043 more to completely satisfied respondents and 1,486 less or not satisfied ones, with 2,321 of all respondents in the model calculation. The difference is due to value 4 ($n=1,689$) and to missing responses for the various model variables. The resolution between the groups in the model is significant (above 99%). Model fit for the intercept only is -2 log-likelihood 1,264.8 and for the final model -2 log-likelihood 971.5.

The direction and strength of the individual parameters were expressed by the odds ratios. Respondents not participating in the Disease Management Programme had a 34% lower chance of being more or completely satisfied with their health compared with DMP participants.

A further statistical significance in this model is that women had a 36% lower chance than men of being more or completely satisfied with their health.

The duration of the diabetes disease does not have an influence in this model on health satisfaction. No influence on health satisfaction is also related to the organisational nature of the medical care provided and with age. However, the severity of the disease also has a high influence on the level of health satisfaction in the model. Those with not severe or less severe diabetes have a seven times higher chance of being more or completely satisfied with their health than those with severe disease.

Also there is a slight significant influence on the health satisfaction attributable to schooling, because the bivariate influence remained statistically in the multivariate model.

Discussion

Initially, we asked whether there were indications that self-selection and social selection processes could mean that health programmes preferentially recruit from social groups with comparatively less need. The finding that significantly more DMP participants (49%) have a higher level of school education than non-participants (45%) could be taken as evidence for such a tendency, from a socio-epidemiological viewpoint.

The results also show that a lower level of education is related to an increased morbidity, a poorer level of information and also a less well-developed ‘preventive attitude’ towards the diabetes. However, in comparison with the other differences analysed between the DMP participants and non-participants, these factors are less pronounced and less influential. Thus, for a series of comparisons the difference between programme participants and non-participants was greater than that between the different levels of school education.

Indications about the strength of the influence of the chosen target variable of satisfaction with the state of health were provided by multivariate analysis. Plausibly, for this target variable the influence of the severity of the disease was greatest, while the duration of the disease, the type of doctor and also age (at least for those in their 60s) played no role. The influence of gender was also greater in this model than in another model, not presented here, with the target variable of satisfaction with the diabetes care provided by the doctor. At the same time it should be noted that the multivariate analysis showed that an independent, positive effect on the satisfaction with the state of health is exerted both by programme participation and also by the higher level of schooling, with the effect due to programme participation being stronger. To this extent it confirms the positive results for the effect of programme participation from the general analysis (Elkeles et al. 2008) and reduces the fears from the preceding Neubrandenburg Regional Survey (Elkeles et al. 2007) that there were selection effects to the disadvantage of those with lower social status.

As in the general analysis (Elkeles et al. 2008) and in the previous Neubrandenburg Regional Survey (Elkeles et al. 2007), the main reasons for deciding to participate were the quality of care and the doctor-patient relationship, with only few differences between basic and higher school education level.

More social influence could be found concerning the differences in treatment provided within the programme. Patients obviously appreciate that the medical personnel and the health insurance company are paying increased attention to their disease, and as shown by various differences in the responses given by the programme partic-

ipants, this applies to a greater extent for participants with a lower level of schooling. Although this group is significantly underrepresented among the participants, a larger proportion of them reported that they were benefiting from the Disease Management Programme.

Although the results of the investigation presented here, in particular after the multivariate analyses, are more unambiguous throughout than we actually expected, it should be noted that some of the results for the non-participants (e.g. frequency of check-ups) were also very good. Although in Germany there have been appreciable deviations by international standards at least until fairly recently from health-care policy targets, it is possible that we are also gradually beginning to see the effects of regional programmes from the period before the DMP was started up (Lippmann-Grob et al. 2006; Blumenstock et al. 2006; Eichenlaub and Steiner 2005; Schunk et al. 2007; Rothe et al. 2008) or that there has been a general paradigm shift in the care for diabetics in Germany.

According to the results of our study of 45 to 79 year olds, it seems that at least for customers of BARMER health insurance there has been a marked (additional) positive effect as a result of the DMP for diabetes mellitus type 2, although it must be added that a single survey of this sort does not tell us anything about the extent to which foreign experience with the effectiveness or efficiency of DMPs (cf. Sidorov et al. 2002) can be transferred to Germany, nor can a survey of insurance customers provide insights regarding cost-effectiveness, at least not on the basis of the evaluation presented here (however, see Elkeles et al. 2008 with evaluations of subjective statements about the use of doctors' services). However, BARMER does have positive results on the basis of comparative analyses of the records of patients with diabetes mellitus who do or do not participate in the diabetes mellitus type 2 DMP (Ullrich et al. 2007; Graf et al. 2008).

Conclusion

Surveys of health insurance customers can provide valuable information about the opinions of the patients themselves and allow the investigation of social influences. In order to reduce the limitations on the potential of customer surveys on the one hand and of quality assurance studies on the other, we propose again (cf. Elkeles et al. 2007) that quality assurance studies should be carried out in order to validate surveys addressing participants in DMPs, and conversely surveys of DMP participants should be conducted to validate quality assurance findings.

Conflict of interest The authors disclose any relevant associations that might pose a conflict of interest.

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